**Title:**

Cloud-based multi-Sensor Remote Data Acquisition system for Precision Agriculture

(CSR-DAQ)

**Presenter:** Jiztom Kavalakkatt Francis

**Abstract:**

Many of the current agriculture systems deployed analog/digital sensors to measure crop monitoring, weather forecast, and environmental sensor data. The significant problems of the current agriculture system are — 1) the inability to combine the collected sensor data into useful information for farmers to make the right decision to optimize the crops; 2) legacy infrastructure and manual data collection; 3) lack of scalability and incompatibility due to the vendor-dependent sensors and legacy data loggers. With the advent of the Internet of Things (IoT), the adhoc and traditional agriculture system adopt precision agriculture methods to improve the quality and quantity of harvest. To realize such precision agriculture methods in smart farming, we require a platform that collects the sensor data, processes into information and visualize the results. The existing custom-made prototype solutions and the industry-grade data acquisition systems are expensive and have limited functionalities to realize the precision agriculture methods. In this thesis, we propose an architecture and testbed-based implementation for a cost-effective active data acquisition system that can autonomously collect, transmit, and process the raw data. The proposed architecture includes four modules - Nodes, Aggregators, Cloud-based Database, and Client-side applications. The functionalities of these modules are — 1) *Node* collects sensor data at specified intervals and transmits the sensor data streams to the *aggregator*; 2) *Aggregator* executes a data serializer for converting the sensor data streams, buffer for local storage, and data transmitter for sending them to the cloud-based database system; 3) *Cloud-based Database* is hosted on Amazon Relational Database Services (RDS) and uses Postgres SQL to facilitate multiple reads, write and no overwrite functionality; and 4) *Client-side applications* include web pages, mobile apps, and services that communicate the cloud-based database system for the field sensor data. We consider the standard JSON format for the data exchanges. For additional security, we leveraged Amazon AWS IoT Core to perform secure data transmission from aggregators to the channel.

The testbed was set up in a greenhouse environment to read controlled environmental data. Collected data from a commercial sensor validated the measurements as a benchmark tool. The obtained results were congruent with the design specifications and satisfied the user requirements. Analog sensors with the proper specifications is compatible with the proposed hardware to read environmental data without additional modifications. Field test implementation also successfully validated the design with real-time data collection with 16-bit ADC for high accuracy. The results with the applied equations have 98% regression to the values expected. This proposed architecture solves the need for smart systems for small-scale farmers by providing them active data acquisition units within budget and allows them to make a decision or automate certain parts of farming such as irrigation, fertilizer control and so on.